

# Implications of Commercial Product Insertion into the National Defense

## "The Rest of the Story"

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**P**aul Harvey is a something of a legend in radio newscasting. First he reads you the headlines from today's newspapers, and then he gives you, "the rest of the story." This is usually a follow-up to a recent headline, or even from some historical event. The rest of the story provides insight gained from an after-the-fact perspective, or *implications* of how the story may have affected other events, people, or places. So, as the respected Mr. Harvey would say, "What's the rest of the story in commercial product insertion into the U.S. military?"

Before we examine individual aspects of "the rest of the story," let's first get an understanding of what the Commercial Off-the-Shelf (COTS) story is all about. What does it mean to the DoD—to the industrial base and to the testing and evaluation sector?

### A Decade of Migration Toward COTS

Over the past decade, our nation's military has been moving toward commercial products and practices whenever possible. More specifically, this means that the DoD is migrating:

- toward a Just-in-Time inventory instead of a Just-in-Case stockpile approach to inventory; and
- toward international standards like those set by the International Orga-

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nization for Standardization, or ISO—and away from military-unique inspection processes.

Moreover, as this migration has gained more momentum over the years, the value of product testing and safety has become even more important.

For more than a century, Underwriters Laboratories Inc. (UL) has served as a



FIGURE 1. Product Category Standards

Category	Representative Samples	Approximate Coverage (%)
Electrical Construction Materials	flexible metal conduit; enclosures; wire and cable; fuses; wire connectors; circuit breakers	40%
Construction materials, industrial HVAC equipment; tanks and accessories	fire doors; steel inside tanks; refrigerating units; fire dampers; air filter units	22%
Appliances; tools; test and measuring equipment; information technology equipment	portable electric tools; heating pads; microwave ovens; coffee makers; information technology equipment; measuring and testing equipment	21%
Fire protection/suppression; burglary protection and signaling equipment	fire extinguishers; hydrants; holdup alarm units and systems; burglary-resistant safes	9%
Test method and component	plastics; printed wiring boards; tests for flame propagation of fabrics and films; tests for fire resistance of roof covering materials.	8%

key architect of the U.S. product safety system, while providing unparalleled U.S. market acceptance. UL is working for a safer world through its unwavering commitment to public safety, absolute integrity, and independence.

For these reasons and because of a shared mission of safety, the Federal Government has relied on UL for the past 25 years to help streamline its standards development and acquisition processes.

Back in the 1970s, DoD realized that it could reduce costs significantly by buying COTS products—the non-combat variety. Prior to this time, the DoD had contracted out to select vendors, manufacturing products to their own standards—either MilSpecs [Military Specifications] or FedSpecs [Federal Specifications]. This can be a costly process. A coffee maker customized to MilSpec manufacturing standards is much more expensive than buying the familiar off-the-shelf variety. And the coffee tastes the same.

After DoD started to buy more and more products off the shelf, it made even more sense to review MilSpec standards relative to the content of UL Standards. It simply made good business sense con-

sidering the fact that the products of most American manufacturers complied with UL Standards of Safety.

Over the past two decades, the DoD has adopted 164 of more than 775 UL Standards. These can be broken down into five product category standards, representing some of the most widely used commercial products utilized by the National Defense (Figure 1).

Most of these products bear the UL Mark of Safety, as they are released direct from a manufacturer or to a government warehouse, awaiting distribution to any number of military locations and applications.

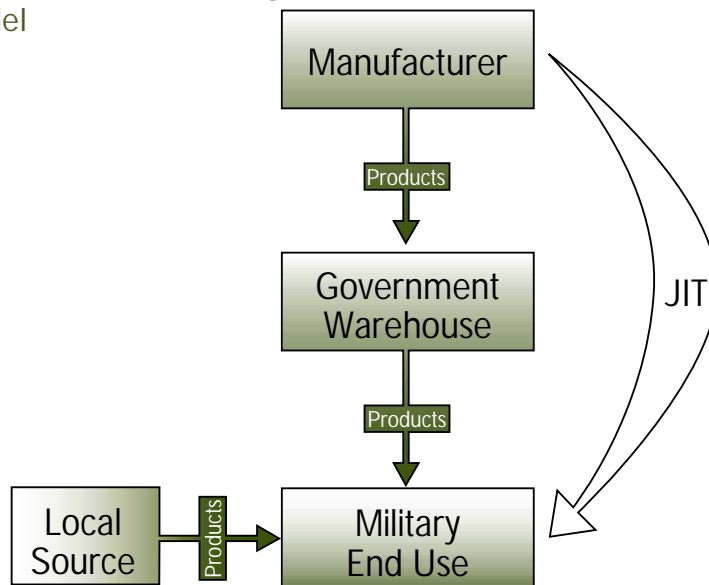
#### Safety and COTS

But in terms of military applications, how does safety play a role in COTS?

#### UL AND THE U.S. GOVERNMENT...A SHARED MISSION

The National Defense, and to a greater extent the U.S. Government, share a mission of safety with UL. The military's concern for safety is not unlike UL's mission of promoting public safety and environmental protection. However, to successfully support the mission of national defense, the safety of military personnel and their families should be of

FIGURE 2. Manufacturing Process to End-Use Distribution Model



utmost importance. One example would be product safety. From a broader safety viewpoint, it's just as important for a missile launcher as it is for a toaster oven. This could be an actual product or a component—for example, electrical wiring, or insulation—which comprise almost half of the UL Standards adopted by the government. If we can't be confident that everyday products meet minimum safety requirements, it's difficult to be confident in more sophisticated technologies and applications.

The U.S. Government and UL both share a mission of public safety, and exciting opportunities to work together are becoming ever more apparent.

#### SAFETY AND THE NATION'S AGING WIRE INFRASTRUCTURE

For example, the National Transportation and Safety Board (NTSB) concluded that a TWA crash was the result of a short circuit spark near a fuel tank—due to an older, deteriorating electrical wiring system. The NTSB recommended further research into new technology that could prevent the sparking. This new technology is in the form of Arc-Fault Circuit Interrupters (AFCIs).

Also last year, the President's Advisor from the Office of Science and Technology Policy stated that "a coordinated government-industry partnership is required to resolve the hazard of aging

wire systems...." And this not only applies to aircraft, but to nuclear power plants and NASA equipment as well.

UL was recently asked to participate in an important study, along with other experts from the military, Consumer Product Safety Commission, Department of Energy, and the National Transportation Safety Board.

The panel was mainly concerned with two problems:

- How to test an aging wire infrastructure for potential problems.

- How to better protect the wire itself through the application of new technologies such as AFCIs.

For both of these problems, UL offered its electrical research and testing expertise, which had already spearheaded and developed the safety standards for AFCIs. This is a prime example of how UL and DoD could work together in the future—which brings us to our first *general* implication.

Opportunities for UL and DoD to work together throughout the entire acquisition cycle are growing—from developing standards, to enhancing the manufacturing and pre-shipment processes, to specialized testing on commercial products for military applications.

#### SAFETY ADDS VALUE

Another *general* implication is that safety adds value to the product. Studies have shown that over 60 percent of the consumer public would not buy an electrical product without a safety mark. This generally refers to the UL Mark, with 17 billion released in 2000 alone.

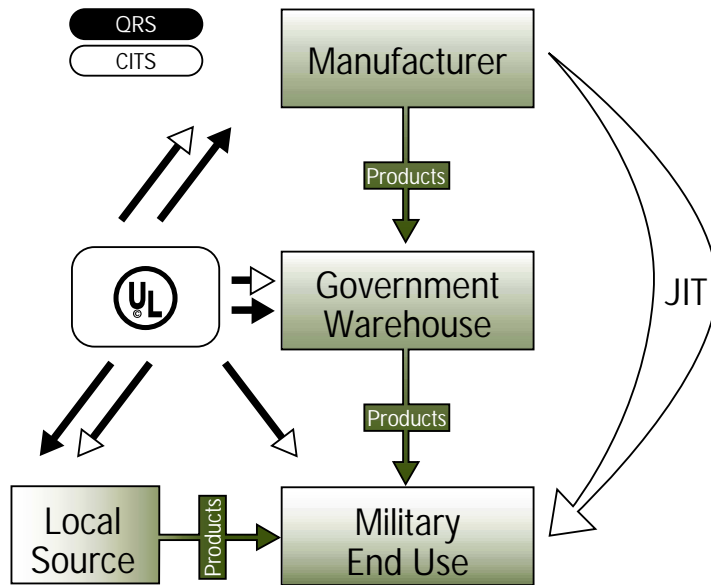
Consumers today are better informed than ever. They understand that when products are brought into their own homes, safety cannot be taken for granted. The real issue is the *cost* of product testing, which can decrease the bot-

FIGURE 3. Quality Registration Systems

- ISO 9000: An overall quality management system standard — industry-wide
- QS-9000: A standard specific to the automotive industry
- TE Supplement: A standard for suppliers to the automotive industry
- ISO 14001: An international standard for environmental management systems
- AS 9000: A standard specific to the aerospace industry
- VDA 6.1: A standard required by German automobile manufacturers
- TickIT: A standard specific to the information industry



FIGURE 4. Distribution Model



tom line and therefore be vulnerable to criticism.

#### DOES SAFETY ADD VALUE TO A PRODUCT?

That's been a question posed to the testing and evaluation community by both the military and industrial sectors over the years. And here's another question to consider, "What value do you put on human safety?" What liability risks and loss of property are you willing to assume? In other words, what price are you willing to pay when safety is not a demand driver?"

When those questions and the associated answers are considered, testing and evaluation can be viewed as an investment, aimed at improving the products used by military personnel. What's more, the National Defense Program Managers who buy off-the-shelf are the same consumers who bring UL Listed products into their own homes. When viewed from that perspective, each one of us is a consumer!

So far in this analysis, two general or overarching implications have emerged:

- Opportunities to work together.
- Safety adds value.

But emphasis needs to be placed on more *specific* implications, so let's take a

closer look at where we've been, where we are—and where we might be heading with commercial product insertion into National Defense systems.

#### "COTS Means Business!"

That is what could have been ripped from the headlines had Paul Harvey re-

ported this story. The most positive and immediate implication was the tremendous business opportunity for all of us—both public and private sectors. The military has been reducing costs and the manufacturer has been increasing revenues. But the more specific implication for the testing and evaluation sector is that voluntary standards decrease redundancy and duplication of efforts.

The sheer *scope* of commercial product insertion can be seen through a few examples: off-the-shelf electrical components are finding their way into nuclear submarines, missiles, and aircraft.

On the other hand, an equally functional \$75 dollar off-the-shelf model has replaced a \$400 MilSpec power drill from a decade ago.

So what's the more specific implication here? *If you buy a product off-the-shelf, it can meet all military applications.*

#### The Rest of the Story!

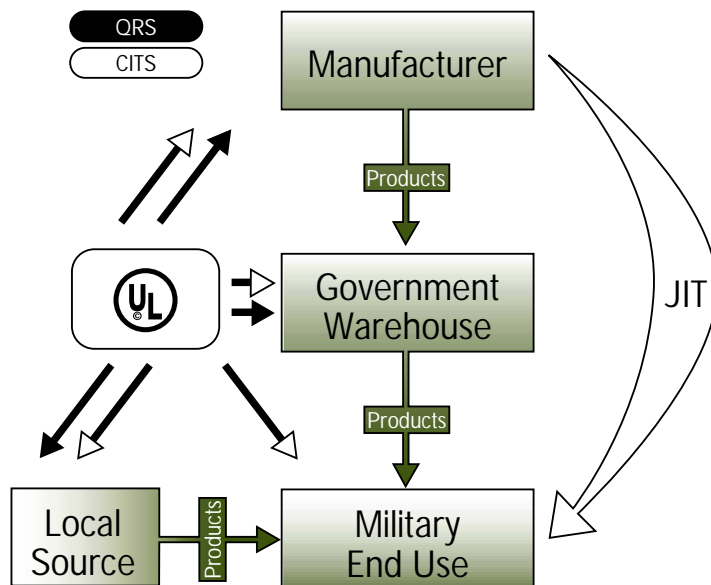
But as Mr. Harvey would say, "Here's the rest of the story."



FIGURE 5. Representative Pre-Shipment Specifications

- |                                 |                              |
|---------------------------------|------------------------------|
| • Color verification            | • Bar code verification      |
| • External finish quality       | • Performance tests          |
| • Lot quantity                  | • Accessory characteristics  |
| • Thickness, volume, and weight | • Indoor/outdoor temperature |
| • Label markings                | • Humidity resistance        |
| • Model numbers                 | • Dust protection            |
| • Packaging                     | • Special end-use conditions |
| • Shipping addresses            |                              |

FIGURE 6. Two Ways of Validating Product Before Shipment



Now for many products a one-size-fits-all implication holds up—but in most cases, one size does *not* fit all. A very comprehensive study last year by the Office of the Secretary of Defense entitled, “Commercial Item Acquisition: Considerations and Lessons Learned,” predicted that a gap will exist between DoD and commercial use—and the gap may be large.

#### Customization

In all cases, program offices and contractors alike discovered that the commercial items lacked essential capabilities, requiring extensive customization. This resulted in cost and schedule overruns that could have been avoided, if only the contractors and stakeholders had held open communications before production.

However, some customization will always be expected, considering the scope and breadth of military applications. For instance, DoD buys a lot of trucks. What’s more, the military classifies trucks as a commercial product. Yet, some of those trucks are used in military-unique applications and subject to customization. An example would be a longer exhaust pipe installed on certain trucks driving through rivers.

So the more realistic implication is that one size does not fit all, because some

form of military-unique requirement will always be embedded within the COTS program. This implication should lead us to a solution that could reduce or—at best—facilitate those special needs cost effectively. Included in this solution are standards development *prior* to the manufacturing process; and inspection, testing, and auditing during and *after* the manufacturing process.

#### Standards Development

Let’s look at the very first step in the procurement cycle, i.e., standards development.

UL is very excited about its new, enhanced standards development process. The Standards Technical Panel (STP) is comprised of balanced participation from diverse groups. Consumer advocates, manufacturers, AHJs (Authorities Having Jurisdiction), engineers, and military government representatives—all will have an equal voice in the process from the very start of the standards development and revision processes. In this way, DoD’s interests will be represented *before* the product is ever produced.

This holds great promise for strengthening the COTS program—by providing more commercial items that the military could directly insert into the National Defense system. In fact, UL is

asking DoD to help identify new candidates who may be future panel members. In terms of open communications to reduce the gap between off-the-shelf products and customization, UL’s new STP process is an initiative with great potential whose time has come.

#### Does One Size Fit All?

Another COTS assumption is that targeting “basically generic” products can achieve a one-size-fits-all goal. But just the opposite has been the case. Just consider the problem faced by manufacturers of electrical sleeves that are used for insulation. If they wanted to participate in the COTS program, they had to manufacture a special electrical sleeve to a MilSpec. This meant producing two different lines: one for commercial use and one for the military. And of course, maintaining two different inventories can only increase overhead costs.

The solution? Elevate the manufacturer’s base requirements to the higher military specifications and *produce just one sleeve*. The end result raised the quality standards for the consumer sector—a win-win scenario.

Another implication is that if the DoD is buying more commercial products, they need to embrace commercial “best practices” in the distribution system—from the plant or warehouse to the actual end user. In fact, the military has been forced to make major distribution changes, because inventory control has become a serious issue.

A Report to the Congressional Committees by the General Accounting Office (GAO) last November stated, “...The lack of adequate controls over inventory shipments could substantially increase the risk that millions of dollars will be spent unnecessarily. For example, GAO records indicate that the Army could not account for about \$900 million dollars in shipped inventory for 1998....”

Retired Army Gen. Henry “Hugh” Shelton, former Chairman of the Joint Chiefs of Staff, reported, “...The military is looking for ways to improve its distrib-

FIGURE 7. Site-Specific Specialized Testing

PURPOSE OF TEST	SITE-SPECIFIC CONSIDERATIONS
Investigative	Does a certain plastic give off toxic fumes under high temperatures? Or when subjected to fire, does it give off toxic smoke that would impair visibility and be harmful?
Functionality	Will a power tool operate under "Desert Storm" conditions with sand and heat factors? Or under jungle conditions with high humidity and temperatures.
Reliability	Will a certain product perform reliably?
High Technology	Are signal disruptions present in the form of electromagnetic interference or lasers?

ution systems....” This would support the migration to commercial “best practices” such as ISO and Just-in-Time models. But to facilitate this kind of quick and nimble distribution system, certain quality assurance programs must also be in place to ensure *accuracy*—*accuracy* in the integrity of the product itself, *accuracy* in the shipment ordered, and *accuracy* in military-specific end-use applications.

#### Best Commercial Practices— UL’s Adjunct Services

UL’s adjunct programs such as: Quality Registration Systems, the ISO 9000 series Commercial Inspection and Testing Services, and Specialized Testing are designed to enhance DoD’s distribution system, as it evolves to a “best commercial practices” model. The military’s current “Manufacturing Process to End-Use Distribution Model” is depicted in Figure 2 (p. 24).

#### QUALITY REGISTRATION SYSTEMS

UL assesses and registers organizations whose quality systems conform to international standards such as the ISO 9000.

While many are familiar with ISO 9000, its relationship to COTS is not always clearly understood. In fact, discussion within the military procurement community has focused on whether ISO 9000 should be an allowable expense

on a DoD contract. This is a valid concern. Consider, however, that to have an effective program, ISO 9000 must be directly tied to specific procurement processes and procedures. And in terms of military procurement, that covers everything from when the purchase orders are issued, to contracts being issued, to the whole manufacturing process, to documentation of shipping and distribution. In other words, ISO provides the framework—and for it to be cost effective, the military needs to specify requirements within the framework, i.e., the more exacting the specs, the more effective the ISO standards. In this way, ISO can provide a higher level of confidence that the National Defense will receive a consistently high-quality product, packaged and shipped in a consistent manner.

*The key benefits to the manufacturer are:* higher levels of international market acceptance and fewer product returns. *The key benefits to the military are:* gaining more control over inventory systems through ISO quality assurance, which can be translated into a tremendous cost savings. This military benefit has to be leveraged against the newer Just-in-Time inventory system, which has reduced the number of government warehouses and the associated cost burdens.

The specific implication here is that, once warehouses have been eliminated,

the military will need even higher levels of confidence from its suppliers. A Just-in-Time delivery system leaves little margin for error. In this scenario, quality registration systems would provide the extra measure of confidence. Some of the applicable registrations are shown in Figure 3, p. 24.

By overlaying a Quality Registration System (QRS) on the Distribution Model (Figure 4, p. 25), a higher level of accuracy can be achieved through more stringent requirements and processes.

#### COMMERCIAL INSPECTION AND TESTING SERVICES

Whereas, QRS validates the management system, UL’s Commercial Inspection and Testing Services (CITS) can validate and verify the actual order or “lot” before shipment. Consider the current situation.

Procurement is worldwide, and recently the DoD has relied on local sourcing whenever and wherever possible. So the need for pre-shipment inspection is becoming increasingly more important.

Many buyers require source inspections (factory assessments, pre-shipment inspections, etc.) because they are either unsure that the supplier or source will indeed ship the product that has been specified, or the complexities and associated risks demand it. Examples of pre-shipment specifications that could be verified are shown in Figure 5, p. 25.

Since suppliers can ship products that are not in compliance with the buyer’s specifications, due to unintentional errors, quality problems, or simple miscommunications, the need for inspection and testing services exists. And UL’s service program can check that products made at the manufacturing source (or port of entry) meet delivery specifications and requirements.

In many cases, the military may have a higher specification that falls outside of conventional usage, therefore requiring additional testing. By using UL’s testing expertise with over 18,000 products, field representatives in 90 locations

worldwide could perform or witness whatever tests were specified at the point of manufacture. This would eliminate the need for sending military inspectors all over the world to perform the same activities. UL has Field Representatives *on the ground* who could evaluate both the quality and accurate delivery of goods. And this is *before* the military would actually take ownership of the products.

So in brief—here's "the rest of the story" in validating product before shipment.

Essentially, there are two ways to accommodate such validation (Figure 6, p. 26). The dark arrows in Figure 6 represent QRS, which validates the system to ensure consistency of quality. The clear-tipped arrows represent CITS, which validates consistency through pre-shipment inspection and testing. Together, UL's Quality Registration System and Commercial Inspection and Testing Services could help improve the National Defense inventory control system.

#### SPECIALIZED TESTING "...WHERE SITE NEEDS MUST PREVAIL..."

UL tests many products that are purchased off-the-shelf by the DoD for everyday use. In many instances, the UL Mark is the only indicator needed to show that the product meets safety requirements. While these products would not meet certain rigorous military specifications, they are certainly appropriate for everyday military use—if used in a "consumer-like" environment. For example, coffee makers and air-conditioners at Fort Bragg's office facilities.

But other products and devices intended for everyday use—such as small household appliances—also may be used in military environments. Under such conditions, products are expected to perform under more rigorous usage, i.e., temperature/humidity extremes, dust and dirt, acidic/caustic fumes, hazardous and flammable gases, and the like.

In those instances, UL can perform site-specific specialized testing on products

targeted for extreme conditions, as categorized in Figure 7 (preceding page).

Figure 8 below represents an idealized, Full-Complement-of-Services Distribution Model, with UL's Specialized Testing.

#### UL and High-Technology Testing

Of particular interest to the DoD, are UL's Electromagnetic Compatibility Testing (EMC) and laser testing—two areas of increasing military concern as emerging threats.

In addition, UL has five EMC laboratories in the United States and various locations worldwide that can conduct tests and issue an international EMC Mark.

UL's laser testing program is designed to provide very specific testing needs. Manufacturers, government agencies, and others may request that a third party provide this kind of measurement data. UL can perform and report whatever test data is required in this capacity.

For additional information, <http://www.ul.com> is a comprehensive resource for any of the adjunct services referenced in this article.

#### Stay Tuned

Commercial product insertion has positively impacted the military, the indus-

trial base, and the testing and evaluation sectors—although it is not the one-size-fits-all approach that many had hoped.

Overall, there appear to be two "big picture" or overarching implications emerging: 1) opportunities to work together throughout the acquisition cycle abound; and 2) safety adds significant value.

In looking at the "rest of the story," the following more specific implications were discovered:

- The military is reducing costs.
- The manufacturers are increasing revenues.
- One size off-the-shelf does not fit all.
- The distribution channel is migrating toward a commercial "best practices" model.

Most importantly, however, it was also discovered that UL and the National Defense community are truly working *together* for a safer world. So what's the "rest of the story" in the years to come? Stay tuned. And as Paul Harvey would sign off, "Good Day!"

**Editor's Note:** Castino welcomes questions or comments on this article. Contact him at [tom.castino.ul.com](mailto:tom.castino.ul.com).

FIGURE 8. Full-Complement-of-Services Distribution Model

